A Liquid Oxygen Vaporiser.

By EDGAR A. GRIFFITHS.

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Liquid oxygen can be used for a variety of purposes in place of the compressed gas. When the weight of the apparatus for the supply of the oxygen is an important factor, as in the case of breathing apparatus, there is considerable economy in carrying liquid oxygen instead of compressed gas.

For most purposes a steady stream of gas is desired, so means have to be provided for vaporising the liquid at any specified rate from the container. Since the most efficient form of container is the Dewar vacuum vessel, the problem resolves itself to devising a method of controlling the heat input into the liquid when contained in a vessel of this type. An electrical heating coil affords one means of doing this, but the weight of the necessary batteries for supplying the current is a serious drawback when a portable apparatus is desired.

In the course of some experiments on a liquid oxygen apparatus for mine rescue work the author found that it was possible to control the heat conduction into the inner vessel by bringing a small area of the wall of the outer vessel into contact with that of the inner vessel. By varying the area of contact any desired rate of evaporation of the liquid, within certain limits, could be obtained.

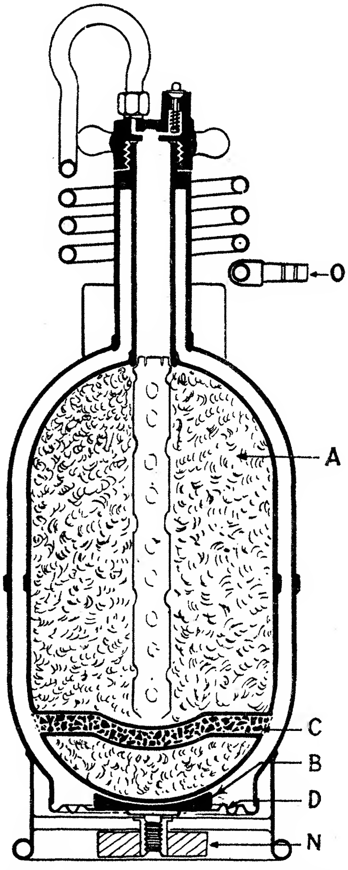

FIG. 1.—A, absorbent material; C, tube through inner vessel containing cocoa-nut charcoal; B, copper block; D, corrugated silver diaphragm; N, screw and nut controlling position of block B.

In practice the apparatus is constructed as shown in fig. 1. The double-walled vessel is made of copper and the bottom of the outer vessel is cut out and replaced by a flexible diaphragm of silver (D). This diaphragm has soldered to its centre a copper block (B) shaped to fit the contour of the inner vessel. A screw and nut (N) is arranged below the diaphragm in order to adjust its position, in or out, thus enabling the block to be brought into contact with the inner vessel at will. Two turns of the adjusting screw are required from "off" to "full on" and this arrangement varies the rate of delivery of the gas from the natural rate of the flask (*i.e.*, about ½ litre per minute) to 12 litres per minute measured at normal temperature and pressure.

The variable rate of gas emission is due to the fact that the copper block does not come instantaneously into contact with the inner vessel over its entire surface but accommodates itself more and more as the screw is released.

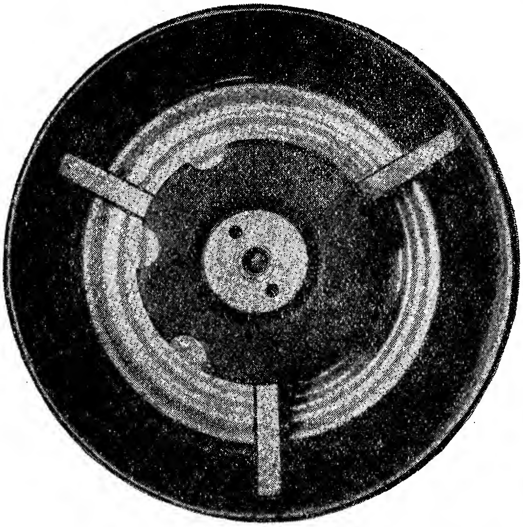

Fig. 2.—Underside of flask showing silver diaphragm and adjusting nut.

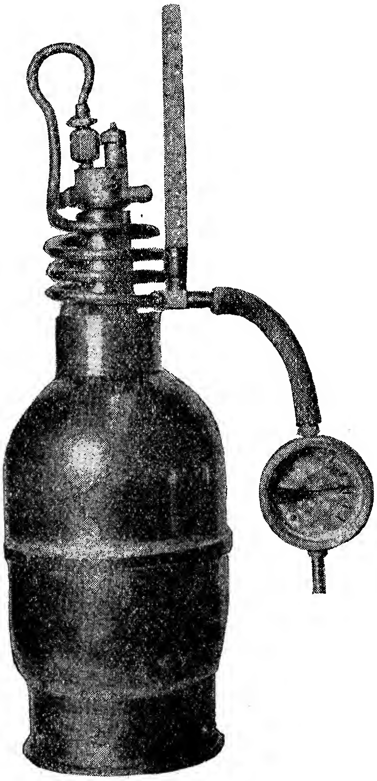

Fig. 3.

The adjustment is perfectly continuous throughout the range, and any desired rate can be obtained within the limits; the usual setting being 3 litres per minute when used for breathing apparatus. The delivery of the gas in response to a change in the adjustment is surprisingly quick and when once set has the convenience of remaining sensibly constant for many hours.

The silver diaphragm and adjusting nut can be seen in fig. 2.

The vacuum vessel used in the experiments had a capacity of about 1½ litres of liquid but was filled with an absorbent packing of asbestos wool to ensure non-spilling when carried. The capacity with absorbent filling was slightly over 1 litre of liquid or 850 litres of gas at N.T.P. The oxygen is delivered through a few turns of copper tube so as to warm up the gas before delivery to the breathing bag.

A simple flow meter is inserted in the circuit (see fig. 3) which indicates at any instant the quantity of gas being supplied. This instrument consists merely of a small vane pivoted so as to swing against the restoring force of a hair spring. The gas enters by way of a wide bore jet and the momentum of the stream causes a deflection of the vane.

The apparatus described was developed in the course of an investigation carried out with the Tyndall Mining Research Studentship of the Royal Society, and the author desires to record his indebtedness to the Tyndall Research Committee for their kind encouragement, also to Sir Joseph Petavel for the use of some of the facilities of the National Physical Laboratory.

A Simple Apparatus for Approximate Harmonic Analysis and for Periodicity Measurements.

By W. Lawrence Balls, M.A., Sc.D. (Cantab.), Late Fellow of St. John's College, Cambridge.

(Communicated by Dr. F. F. Blackman, F.R.S. Received May 2, 1921.)

The apparatus described in this paper was devised in order to test an extensive series of engineering data for the existence therein of a suspected periodicity. In the first instance, we applied the periodogram method* but found that the time needed for adequate examination by this method was prohibitive. Several other devices were tried before we arrived, as a development from a suggestion made by Mr. G. Udny Yule, F.R.S., at the present apparatus, which was found to be not only satisfactory as a method for detecting periodicity but was also useful as an harmonic analyser. The apparatus has the advantage of being simple to construct, and inexpensive. Further, the construction is such that there can be no change of zero during its use, and while the reduction of the observed results to absolute measure

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* 'Edinburgh Mathematical Tracts,' No. 4 (London, 1915), G. A. Carse and G. Shearer, "A Course in Fourier's Analysis and Periodogram Analysis."

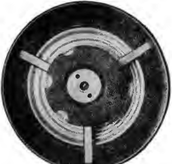

FIG. 2.—Underside of flask showing silver diaphragm and adjusting nut.

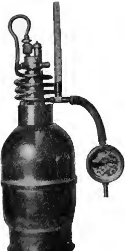

Fig. 3.